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ANALYSIS OF CONTENT AND ORGANIZATION OF THE  
BRADLEY FIGHTING VEHICLE COMMANDERS COURSE

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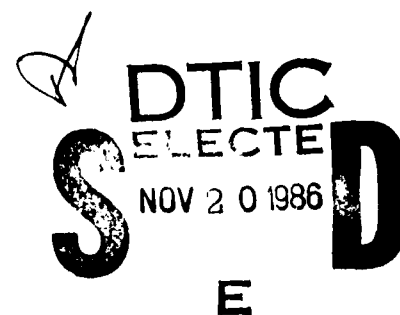


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ARI Research Note 86-9120. Abstract (continued)

➤To be specific, the research note recommends that the overall quality of instruction received by the students being trained as Bradley commanders be improved. The maximum class size should be 30 students. The live fire annex of the Program of Instruction (POI) should be revised to reflect accurate descriptions of both the live fire and concurrent training objectives. A Bradley Infantry Fighting Vehicle (BIFV) tactics test (with a passing grade required for graduation) should be administered, and the tactics portion of the instruction should be augmented by use of guest speakers who are knowledgeable about critical BIFV operational issues. Finally, certain blocks of instructional content (particularly in the areas of tactics and gunnery) that could be added to the course without increasing course length were identified.

# ANALYSIS OF CONTENT AND ORGANIZATION OF THE BRADLEY FIGHTING VEHICLE COMMANDERS COURSE

## EXECUTIVE SUMMARY

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### Requirement:

To critically review the content and organization of the Bradley Commanders Course administered by the U.S. Army Infantry School and to determine the degree to which the present form of the course is responsive to the needs of Bradley units.

### Procedure:

Background information was obtained by review of relevant field manuals and other Army publications pertaining to Bradley operations. On-site observations obtained during field exercises conducted by Bradley units contributed additional information. Review of the POI, lesson plans, training schedules, student hand-outs and other course materials was conducted. Researchers participated in several iterations of the course.

### Findings:

Areas where constructive interventions would have high payoff potential were identified. Augmentations of course content blocks to improve instruction in gunnery fundamentals and tactics, and integration of related course content to reflect the interactions among separable tasks, should be implemented. The importance of tactics instruction can be emphasized by incorporating additional exercises and adding presentation of critical tactical issues by guest instructors. The present course length can be maintained through efficient use of concurrent training time during the present live fire block. Class size should be maintained at 32 students to preserve a 3-to-1 student/instructor ratio. Detailed recommendations in these areas were formulated.

### Utilization of Findings:

Implementation of the recommendations by the appropriate action agency will improve the institutional training of individuals about to be assigned to command of the Bradley vehicle.

# ANALYSIS OF CONTENT AND ORGANIZATION OF THE BRADLEY FIGHTING VEHICLE COMMANDERS COURSE

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## BACKGROUND

Since August, 1983, the Fort Benning Field Unit of the Army Research Institute (ARI) and its resident contractor, Mellonics Systems Development Division, Litton Systems, Inc., have been conducting a research program to develop training and improve operational effectiveness of the Bradley Infantry Fighting Vehicle (BIFV) under all visibility conditions. The first year of a two year work effort focused on the identification of required improvements while research was conducted during the second year to determine equipment, techniques, and training to improve BIFV operations.

Two major areas of focus during the first year of effort were tactics and gunnery. Analysis of gunnery included a review of gunnery programs of instruction (POI), lesson plans, training literature and manuals, and observation of all U.S. Army Infantry School (USAIS) courses (BIFV Gunners, Master Gunners, and Commanders Courses) that conducted gunnery training. The analysis of tactically related issues included observation of mechanized infantry (M113 and BIFV) field exercises and a review of mechanized and BIFV related instruction provided by USAIS. Observations of field performance occurred in Fort Hood, Texas and with the 3rd Mechanized Infantry Division in the Federal Republic of Germany during conduct of formal unit evaluations (Army Training and Evaluation Program). Observers remained with squads, platoons, and companies on a 24 hour a day basis to allow a comprehensive analysis of performance. Analysis of USAIS mechanized infantry tactical training focused on a review of POIs for all commissioned and noncommissioned career development courses in addition to the BIFV Commanders Course.

The BIFV Commanders Course trains squad leaders, platoon leaders and company commanders for BIFV operation and maintenance. Attendance is based on either designation for or current assignment to a BIFV unit. Students graduate from the six week course with a 11M Military Occupational Specialty (MOS). Course content consists primarily of 11M MOS Skill Level 1 tasks, gunnery, and tactics. Tactical instruction is provided by the Tactics Division, Combined Arms and Tactics Department (CATD), USAIS. Gunnery and Skill Level 1 instruction was provided by the Weapons, Gunnery, and Maintenance Division (WGMD), USAIS prior to December, 1984 at which time the 29th Infantry Regiment assumed responsibility. The course content and instructor staff did not undergo significant changes during this reorganization.

In August, 1984, WGMD met with ARI to present a list of problem areas associated with the BIFV Commanders Course. These problems are summarized in Table 1. A major source of concern as indicated by items 1 through 4 was the impact of large classes on overall training effectiveness. Certain classes had a student size that far exceeded recommended numbers; this had a negative impact on both training and the morale of the students and instructors. The WGMD also was interested in the feasibility of reducing the length of the course if class size were restricted to the recommended maximum.

Table 1

Potential Areas of Analysis Presented by WGMD, USAIS

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1. Optimal training techniques and time required to achieve training objectives
  2. Optimal student-to-instructor ratio
  3. Optimal and maximum number of students per class
  4. Optimal course length with current POI
  5. Adequacy of gunnery related tests
  6. Adequacy of graduation standards
  7. Requirement for end-of-course examination
  8. Requirement for live-fire qualification exercise
  9. Effectiveness of training and utilization of time during prefire and live fire gunnery
  10. Training with U-COFT
- 

The WGMD's concern over current testing and its impact on student graduation from the course was indicated by items 5 through 8. Item 9 reflects the perception that prefire gunnery training is not as effective as possible and that live fire training creates noticeable problems in effective and efficient use of training time. The Unit Conduct of Fire Trainer (U-COFT) fielded at Fort Benning in mid-1985, lacked guidelines for implementation. The WGMD sought guidance in the integration of this full task training device into existing institutional courses.

PURPOSE

The purpose of this analysis was to further investigateas presented by WGMD. The Fort Benning Field Unit of ARI had independently identified many of the problems cited by WGMD so subsequent analysis to determine improvements in potential problem areas was consistent with ARI's second year work effort. The issues expressed by WGMD pertained almost exclusively to instruction in gunnery and Skill Level 1 training. However, tactics instruction was included in the present analysis because of ARI's prior review and knowledge in that area.



## APPROACH

A comprehensive analysis of the issues of interest would have taken considerable time and resources. Three man months were dedicated to this task excluding time spent on first year efforts which provided meaningful and critical background information.

Primary sources of information for analysis were the Program of Instruction (POI); lesson plans; student advance sheets; content of advanced reading assignments; copies and results of tests; unstructured conversations with students, instructors, and course administrators; and information gained from observing the course. The POIs, lesson plans, and training schedules were examined prior to course attendance to obtain information on tasks taught, conditions under which tasks were performed, performance standards, techniques for training the tasks, resources required for training, time devoted to each task, integrated training of related tasks, sequence of training, and type of training (e.g., lecture, practical exercise). Advance sheets, including literature sources, indicated the preparation required of students prior to a particular class or block of training.

Observation of course conduct was critical for issues related to student-to-instructor ratios, actual versus POI-specified time devoted to a task, number of times a task was performed, performance feedback, use of concurrent training when required, and classification of student participation during training. Student participation was categorized as follows:

1. Performing a scheduled task.
2. Observing performance of a scheduled task.
3. Performing a POI task not scheduled for that time period.
4. Performing a BIFV related activity not listed in the POI.
5. Neither participating in nor observing training.

The most beneficial source of information was gained from attending and participating in the BIFV Commanders Course. The primary purpose of class observation was to obtain information on student performance and the effect of course organization on training effectiveness and efficiency. Observations were obtained in a manner that did not disrupt class activities. The observer performed required tasks only if all students had completed their training for that task.

Class 1-85 of the BIFV Commanders Course was observed in its entirety. A major portion of training provided by WGMD occurred with one assistant instructor (AI) dedicated to a particular group of usually three and, at the most, four students. The observer usually remained with one group during a particular class or block of instruction to minimize disruption. However, given the location of the primary group of observation, it was often possible to observe training received by several groups.

Gunnery training is very similar for both the BIFV Gunners and Commanders Courses. In addition to Class 1-85, entire or major portions of prefire and live fire gunnery have been observed in a total of 6 iterations of the BIFV Gunners and Commanders Course. One complete BIFV Gunners Course was attended.

The tactics portion of the BIFV Commanders Course was observed in Classes 3-84, 1-85, and 3-85. A description of tactical training prior to Class 3-84 was obtained from interviews conducted with instructors who had previously taught the classes.

Student reading assignments of Class 1-85 (BIFV Commanders Course) were reviewed for the following: the technical manuals for the hull (TM 9-2350-252-10-1) and turret (TM 9-2350-252-10-2), the soldier's manuals for Skill Levels 1 through 4, the BFV gunnery manual (FM 23-1) and the field manual for the Mechanized Infantry Platoon and Squad (FM 7-7J). Additional review was conducted on unassigned portions of FM 7-7J, FM 23-1, and TM 9-2350-252-10-2 to determine those aspects of BIFV operations not covered in training.

A major source of information on training requirements and problems was obtained from observations of conduct of field exercises in BIFV units in Germany and Fort Hood, Texas in addition to an exercise (Operation Eagle) conducted at Ft. Benning by USAIS to evaluate operational concepts associated with Company Team operations involving BIFVs and the Abrams tank. Problems observed in these environments identified aspects of BIFV operations that may need greater focus in USAIS courses.

#### DESCRIPTION OF THE TRAINING ENVIRONMENT

The analysis focuses on a description of content of training and factors in the training environment that affect training effectiveness and efficiency. Alternative training approaches were not tested by ARI; however, alternative methods and organization of training have been utilized by USAIS over the past two years. Observations and information recorded over this period by ARI will contribute to the data base on which recommendations are formulated. This section of the report will describe separately the training provided for (a) Skill Level 1 and gunnery tasks and (b) tactics. Summary statements, conclusions, and identified problems related to this data base will be presented in the subsequent major section entitled Conclusions.

#### Gunnery And Skill Level 1 Training And Evaluation

Minor changes occur in almost every iteration of gunnery-related and Skill Level 1 training for the BIFV Commanders Courses. However, Class 1-85 of the BIFV Commanders Course was a good representation of training so the description of Skill Level 1 and gunnery training will begin with that class. This will be followed by a description of changes in course organization occurring after Class 1-85. The first two subsections will describe content and sequence of training. The last subsection will describe administrative aspects of instruction to include student-to-instructor ratios, the type of student participation, and other factors.

## Course Content And Training Sequence In Class 1-85

Week One. The first week of training focused on Skill Level 1 tasks and turret operation. Training began with a demonstration of BIFV firepower and maneuverability, a lecture on safety, a demonstration of many of the items included in a combat load, and a brief "walk" through the BIFV. Preventive maintenance, checks, and services (PMCS) of the hull was provided on day two along with training on starting and stopping the BIFV. Driving during the day and night using the driver's night viewer (AN/VVS 2) was the emphasis of day three; concurrent training consisted of communications, tow and tow-starting the BIFV, and use of hand and arm signals. Turret operations training occurred on the morning and early afternoon of day four. Maintenance of the firing port weapon (FPW) was taught during late afternoon of day four and the weapon was fired on the morning of day five.

The Comprehensive Hands-On Test (CHOT) for Skill Level 1 tasks was administered on the afternoon of day five. Communications, hull PMCS, starting and stopping the BIFV and driving were tested. The latter involved driving forward, turning, and moving in reverse. Pivot steers and reverse turns were not required. The PMCS test required identification of problems while checking Items 1 through 13 of the vehicle hull technical manual. For communications, the student had to properly connect the driver's and commander's stations and set up the radio to perform an operational test.

Week Two. The second week was dedicated to (a) turret PMCS and (b) operational and maintenance aspects of all turret-mounted weapon systems in addition to the grenade launcher. Day one was spent on maintenance of the 7.62mm coaxial machine gun with tasks on assembly/disassembly, clearing, procedures for a runaway gun, misfire procedures, lubrication, and loading/unloading ready boxes. Days two and three consisted of similar tasks involving the 25mm gun. Day four covered operational aspects of the M257 grenade launcher (e.g., load, unload, and stow) followed by turret PMCS.

The Gunners Skill Test I (GST I) was conducted on day five. Six stations were used during the morning. Three separate stations tested assembly and disassembly of the 7.62mm machine gun, the 25mm gun, and the FPW. Stations also existed for grenade launcher operations (load, unload, and stow), performing misfire procedures on the coaxial MG and the 25mm gun, and TOW related tasks (inspection of missiles, loading into and unloading of missiles from the launcher, and conducting misfire procedures). Three stations were used for late morning and afternoon testing. They were: turret PMCS, loading and unloading the 25mm feeder and feed chutes, and loading and unloading 25mm ready boxes.

Week Three. Swimming the BIFV and prefire gunnery were trained and Gunners Skill Test II (GST II) was administered. Swimming occurred on the morning and early afternoon of day one. The remainder of the day was spent reviewing and practicing tasks that had not been passed during GST I.

Preliminary or prefire gunnery training occurred on days two through four. Boresighting of turret-mounted weapons was taught on the morning and early

afternoon of day two. At lunch time, students failing portions of the GST I were retested. A lecture on BIFV range card construction was given that afternoon.

On the second morning of prefire gunnery, concurrent training stations were used for range estimation and construction of range cards. Separate stations existed for use of the binoculars and the stadia line of the integrated sight unit (ISU) for range estimation. Following lectures on fire commands, target tracking, gun lay and aerial target engagement, concurrent training stations were used during the afternoon for (a) simultaneous execution of fire commands and gun lays, (b) tracking exercises, and (c) boresighting of turret-mounted weapons.

The last day of prefire gunnery involved concurrent training stations for (a) turret-gun tracking exercises using the snake board and (b) a dry fire exercise with a moving BIFV. A 30-minute lecture covered target acquisition, scanning techniques, identification of target signatures, target classification (most dangerous, dangerous, and least dangerous), precision and battlesight gunnery with the 25mm gun, lead required for moving target engagements, target engagement with the coaxial machinegun (MG), and use of the auxiliary sight. Concurrent training continued in the afternoon with (a) the dry fire exercise with a moving BIFV and (b) training in loading and unloading the 25mm feed chutes and boresighting turret-mounted weapons.

Gunnery Skill Test II was administered on day five. Testing began with a written test covering prefire gunnery topics. The remainder of testing was conducted in three stations. These were for: (a) boresighting; (b) range determination using binoculars and the WORM (Width over Range in Mils) formula; and (c) construction of a BIFV range card.

Weeks Four And Five. The primary training for weeks four and five was live fire gunnery. The class was split into two groups which alternated training days on the firing range and a non-firing range facility. The group not engaged in firing on the range received concurrent training at a location other than the firing ranges. The first day of concurrent training away from the range consisted of instruction (primarily lecture) on the types and operation of subcaliber 25mm gunnery training devices, 25mm ammunition ballistics, and more extensive treatment of advanced gunnery techniques required for engagement of moving targets and firing from a moving BIFV. Training during the second day of concurrent training concentrated on breaking and joining tracks and more extensive review of the turret technical manual. Other concurrent training included characteristics and use of the thermal mode of the ISU; a review of master gunner training and the role of the master gunner in the unit; and a scaled target range for practice of target acquisition, gun lay and fire commands. One day of concurrent training during live fire included a range card station and a thermal viewing station for observing BIFV firing on the move.

The sequence of training for live fire was 25mm gun baseline, moving engagements using the 7.62mm coaxial MG, and stationary and moving engagements as part of the vehicle team combat exercise (VTCE). Baseline firing involved untimed presentation of stationary and moving vehicle silhouette targets for engagement with the 25mm gun. The moving coaxial MG

engagements were an attempt to train integrated individual and crew tasks during moveout engagements while using ammunition that is less expensive than 25mm. The VTCE involved engagement of 7.62mm coaxial MG and 25mm gun type targets in day and thermal modes of operation with the ISU. Students were also given the opportunity to fire from both the gunner's and commander's stations.

#### Course Content And Training Sequence Changes After Class 1-85

Beginning during Class 1-86, weeks one and two were reorganized to allow completion of training and student performance evaluation of hull-related operations prior to initiation of turret and weapons maintenance training. As part of this change, swimming was shifted from week three to the day after driving during week one. In addition, firing of the FPW during week one was eliminated from the course since commanders do not fire the weapon. FPW maintenance training was shifted to week two with weapons training for the 25 mm gun, the coaxial MG, the TOW missile system, and smoke grenade launcher. Another significant change was the addition of 4 hours (total of 12 hours) to turret operations which now begins in the afternoon of the last day of week one.

Introduction of the U-COFT at Ft. Benning has changed concurrent training during live fire training (weeks four and five). As in Class 1-85, one group received live fire training while the other underwent concurrent training at training facilities away from the range. Groups alternated daily between the range and non range facilities. Scheduled concurrent training included 25mm ballistics and familiarization on the Standardized Test Equipment (STE-M1/FVS). The majority of remaining concurrent training time was devoted to the U-COFT. Firing from a stationary position at night with the aid of a range card will be executed on an experimental basis.

#### Administrative Aspects Of Class 1-85

The technique or methodology that produces the most effective and efficient training is determined largely by the training requirement. Presentation of some information can be performed effectively using a classroom lecture. However, operation of equipment and weapons (Skill Level 1 and gunnery tasks) is hands-on oriented as illustrated in Table 2. Total hours in the POI are compared with that portion spent in practical exercise training that requires hardware or equipment. Of the 226 hours of training time devoted to gunnery, 89% (201.5 hours) required either BIFVs or weapons.

Hands-on training typically requires low student-to-instructor ratios. The current analysis examined actual student participation or activity during training with emphasis on periods when training required either BIFVs or weapons. When student to instructor/hardware ratios exceed a ratio of 1 to 1 then a certain number of students will not be able to perform the primary tasks.

Table 2

## Hours Assigned To Hardware Oriented and Overall Training for the BIFV Commanders Course

Task Cluster Annex	Total	Hardware-oriented
Vehicle Introduction	2.0	0.0
Hull Operations and Maintenance	26.0	20.1
Turret Operations and Maintenance	11.0	9.5
Weapons System Training	29.0	23.5
Prefire Gunnery	23.0	19.7
Target Engagement	135.0	128.7
Tactics	31.0	26.0
Student Evaluation	20.0	19.1
TOTAL	285.0	246.6

Student-to-instructor ratios and training related participation during scheduled training was determined for Class 1-85 during major periods of training where either BIFVs or weapons were required. Class 1-85 had 32 students organized into groups of three or four each (eight groups had three students and two groups had four students). Each of 10 assistant instructors trained a particular group throughout the course except when a classroom lecture was given and when training occurred in small groups with a committee instructor. The following summarizes major findings concerning student-to-instructor ratios and student participation.

During the first large practical exercise (P.E.), hull PMCS (week one, day two), each group of students had one vehicle and instructor for training. One student with a group typically performed an activity while others watched.

Organization for the driving (week one, day three) was more complex. The driving course itself was supported by four BIFVs. Consequently, during the daytime portion of training, the class was split into three squads to allow concurrent training stations for driving, communications, and a combination of towing and tow-starting the BIFV and hand-and-arm signals. One and one-half hours was scheduled for each station. Each student drove for about 20 minutes while one rode in the gunner's position, another rode in the troop

compartment, and the committee instructor occupied the commander's position. While at the driving concurrent station, each student actually drove about one-third of the training time.

Prior to night driving, students received instruction and operational experience with the driver's night viewer. Four vehicles were again used for night driving; however, no other concurrent stations were used.

Much of weapon systems training and FPW maintenance training (a total of about 3.5 to 4 days) required hands-on experience with a weapon. A sufficient number of weapons were available to allow one weapon per group. Consequently, one student performed tasks while the other two watched.

Nearly all of the remaining hardware oriented hands-on training involved some use of the BIFV turret. Turret operation and maintenance (1.5 days), prefire gunnery (3 days), and target engagement (10 days) are all turret oriented. The turret imposes stringent restrictions on training organization. While it varies with task, there are generally four positions on the BIFV to train, to observe, and to instruct. The gunner's and commander's positions are prime areas; however, student observation and instructional guidance can also be provided while sitting on the opened gunner's and commander's hatch covers.

With one BIFV and AI per group, students were either participating in or observing training during turret operation and maintenance. Typically, one student performed task retudents observed. However, there were variations in training procedures. For example, one instructor trained the first student in the group, and then that student trained another while the AI supervised.

During the first day of prefire gunnery, boresighting training was conducted with a higher level of student participation. Two students are required to conduct boresighting and each group had a BIFV for training.

The last two days of prefire gunnery relied almost entirely on concurrent training stations. During the morning of the second day, three squads rotated through one hour stations: range card construction, range determination using the stadia lines, and range determination using binoculars and the WORM formula. The latter did not require a vehicle and there were enough binoculars for all students so that all students were occupied for the entire hour. Student participation was also high with range card construction since there were two students per vehicle. By contrast, only one of six students was occupied at the stadia line training station. In the afternoon, three squads were again used for concurrent training for gun lay and fire commands, tracking using the snake board, and boresighting. One half of the students in the gun lay and fire command station participated while the other half either observed or practiced without a vehicle. Snake board tracking allowed training-related participation for only one of four students at any point.

Manipulation training on the last day of prefire gunnery involved dry fire moving engagements with students in the driver's, gunner's and commander's

positions. Four BIFVs were used. Concurrent training consisted of snake board tracking in the morning. In the afternoon, concurrent training stations covered 25mm feed chute-related tasks and boresighting.

For the first three weeks of the course, training during a particular day corresponded very closely to the training objectives listed under problems being trained. Furthermore, actual training time corresponded closely to that listed in the POI. By contrast, correlation between training objectives, and particularly training time, was widely disparate for actual training and POI listings for live fire gunnery. Excluding the FPW exercise, the POI lists 130 hours for live fire gunnery. Actual training for live fire occurred over a 10 day period which would require an average of 13 hours of training per day. Students spent half of the live fire training days away from live fire ranges in concurrent training. When on the range, students occupied the driver's, gunner's and commander's positions.

The number of students involved in live fire training depended on whether firing was from the stationary position or while moving. Typically, there were four or five BIFVs on the firing line during stationary engagements. Anywhere from one to four vehicles would be firing at any one time. During engagements from moving BIFVs, there were usually three other BIFVs on line awaiting the opportunity to fire while one vehicle was firing. Overall, it is estimated that the typical student spent about three hours actually firing during the 10 days of live fire. However, additional time spent in preparation of fire included hull and turret PMCS, installation of feed chutes, installation of the coaxial machine gun, and ammunition uploading. Actual time spent in these activities was difficult to estimate because of variations in time from day to day and vehicle to vehicle.

The training objectives listed in the POI for live fire gunnery did not coincide with actual training. The objectives were written to describe gunnery qualification engagement scenarios whereas the training is conducted more as a familiarization to BIFV gunnery.

#### Tactics Training

Training for tactics in the BIFV Commanders Course varies more from class to class than does gunnery and Skill Level 1 training. For that reason, it was not possible to give a typical or representative description of training based on that received in one particular class. The following summarizes training as it occurred prior to Class 3-84, and during Classes 3-84, 1-85, and 3-85.

Training Prior To Class 3-84. Tactical training occurred over three consecutive days. A four hour classroom lecture or presentation was followed by four hours of simulated tactical training using terrain models. A field-oriented tactical exercise without troops (TEWT) consisted of 31 POI hours covered during the second and third day of training.

Training methodologies were sequenced to provide a logical progression of training. Students received fundamental information in the classroom. The terrain model exercise allowed application of fundamentals of tactics in a



controlled environment devoid of many field-related distracting influences (e.g., weather). Use of terrain model exercises allowed a logical transition between fundamentals and use of this data in a field environment. The TEWT focused on planning and execution of tactical operations. Realism of execution was limited by lack of subordinate troops and an opposing force.

The initial block of classroom instruction consisted of four separate topic areas lasting one hour each. Topics were Introduction, Offense, Defense, and Specialized Missions. The tasks and training objectives for the last three topics are presented in Table 3.

The terrain model exercise was equally divided between offensive and defensive operations. A five paragraph platoon level operations order (OPORD) was given for each scenario and each student was given 30 minutes to prepare his plan. Selected students presented the plan to the class and the plan was critiqued by instructors.

The first day of the TEWT began with a road march to an area used to practice hand and arm signals in conjunction with BIFV movement formations. Students were then given an OPORD for a movement to contact and had to develop paragraph 3, Execution. Some students conducted a mounted reconnaissance patrol to the line of departure while others illustrated their plan using a sand table. One student's plan was selected for execution.

In mid-afternoon of the first day of the TEWT, one to one and one-half hours were dedicated to planning for, and conduct of, an antiarmor ambush. Both near (Dragon) and far (TOW) antiarmor capabilities of the BIFV squad were emphasized. The remainder of day one was spent on planning for, and conduct of, a mounted night assault. Map overlays designated the point of departure, release points, probable line of deployment, the objective, and the limit of advance. All students prepared a plan; plans were discussed by the group; and the best plan was selected for actual conduct. The operation was usually completed by 2300 hours. Students were free of training requirements until morning (about 0600 to 0700 hours) of the next day.

A defensive OPORD was given on the morning of the second day of the TEWT. A platoon "battle position" had high speed avenues of approach and a wooded area more favorable for a dismounted Threat approach. Students developed a plan that included fire planning for primary and secondary weapons, primary and secondary engagement areas, and priority of fire. Missions for individual squads included assisting engineers; setting up antiarmor ambushes; emplacement of mines; designation of primary, alternate, and supplementary positions; plans for combat service support (e.g., fuel point and ammunition request contingencies); leadership assignments, and signals. The operation was usually completed between 1100 and 1200 hours. Students returned to the motor pool after the operation.

Actual training time was considerably less than that listed in the POI. Training usually extended from 0900 to 2300 hours on day one and from 0700 to 1200 hours on day two for a total of 19 hours of training.

Table 3

## Training Objectives Listed In POI For Tactics

Operation	Training Objective
Defense	Prepare a BIFV squad defensive position
	Prepare a BIFV range card
	Insure operational security (OPSEC) of a BIFV squad
	Insure OPSEC of a BIFV platoon
	Prepare a BIFV platoon defensive position
	Direct BIFV platoon fires in defense
	Employ a BIFV on battle positions
	Conduct a disengagement
Offense	React to direct fire while mounted
	React to enemy antiarmor fire
	Direct dismount of a BIFV
	Control dismount element formations
	Control mounted BIFV platoon formations
	Direct fire and maneuver of a BIFV platoon
	Direct actions on contact
	Conduct a mounted assault
	Plan a movement to contact
Specialized	Consolidate and reorganize BIFV platoon following contact
	Employ a BIFV platoon in the air defense role
	Organize an antiarmor ambush
	Conduct an antiarmor ambush
	Conduct defensive operations in urban terrain
	Control movement through urban terrain

Training during Class 3-84. The introduction and MOUT portions of classroom instruction were eliminated and time used for these topics was divided between offense and defense. The major portion of the introduction had primarily consisted of presentation of a videotape entitled Second to None; however, this tape was shown earlier in the course during gunnery training.

The majority of the classroom instruction was applicable to both M113 and BIFV tactical units; however, instructors included BIFV-peculiar techniques as they apply to the fundamentals of tactics. During instruction on defensive operations, the BIFV was stated to have a primary mission of supporting the infantry. The BIFV has greater armor protection than the M113, but it was clearly stated that the BIFV is not to be used as a tank. Other comparisons between the BIFV and to the M113 were the smaller size of the dismount element; the ability to kill BMPs and tanks at long range; ability to perform in a combined arms team; longer overwatch capability; problems of 360 degree security for soldiers in the troop compartment because of failure to observe through the vision blocks; and the BIFV's greater speed and maneuverability.

Training during the afternoon of the first day also differed from previous classes. The first hour was an opportunity for students to ask questions. Interestingly, nearly all of the issues discussed related to dismounted aspects of BIFV operations. These included:

1. The BIFV has greater ground to cover with fewer dismount troops.
2. If the Platoon Sergeant is the commander of a BIFV, what does the squad leader of that vehicle do?
3. Under what conditions do either the squad leader or assistant squad leader dismount?
4. With all the weapon systems on the BIFV, where will the platoon leader usually have the greater impact on the battle?
5. What are the speed and vulnerability problems associated with the squad leader getting out of the turret for dismounted operations?
6. The dismount element has a wide range of dismount weapons to select from, but because of fewer dismount troops, firepower is decreased for dismount operations.
7. Is there utility in modifying the BIFV to allow dismount of the TOW?

An offensive operation for the terrain model exercise began after the one hour discussion. Following a company level OPORD given for a movement to contact mission, students developed a plan focusing on Paragraph 3 of the OPORD. Movement techniques and formation, weapons ready posture, and leadership positions were to be considered. Students were organized in groups so that each one had different levels of rank and past mechanized experience. Each group had students that played the role of a company commander, platoon leader, and squad leader for the two BIFV platoons. Fifteen minutes were given to develop plans and each group presented its solution. A total of two hours were spent on this exercise.

A defensive operation using the terrain board was not conducted. Instead, the Principal Instructor discussed issues considered more critical. Student comments and questions during the course of the class indicated disbelief that M113 and BIFV tactics were as similar as indicated in the class. Furthermore, the attitude of many students during the terrain board exercise had not been optimal for learning. Students not in leadership roles were not occupied with meaningful activities. The instructor's presentation stressed and re-emphasized the necessity for knowledge of the fundamentals of mechanized infantry tactics, especially since some students in the class had no prior mechanized experience. It was further stated that refresher training for leaders with mechanized experience was also considered critical.

Nine BIFVs were available for the 49 students during the TEWT: four BIFVs each were used in two platoons and one BIFV was used as the Company Commander's vehicle. Because of the large number of students in the class, two to three students rode in the troop compartment while two were in the turret.

Movement formations, control of movement, and the daytime movement to contact were conducted as in the past. The antiarmor ambush was not conducted. Problems indicated in the After Action Review of the movement to contact were land navigation, no planning for either action on contact or on the assault, and BIFVs were too close to each other during movement. Leaders expressed extreme navigational problems even though 1:25,000 scaled maps were used. On several occasions, a platoon would have or did go in the wrong direction but the situation was remediated by the Principal Instructor. The final assault occurred without dismount contingencies even though BIFVs were usually fully exposed while moving onto the final objective. While not mentioned in the critique, fire control and planning were minimal or non-existent.

The movement to contact mission was conducted a second time because of the problems experienced on the first iteration. New leadership was assigned. Land navigation was no longer a problem; however, there was still no planning for action on contact and at the assault. BIFVs essentially overran the objective with no considerations for security of the vehicle and crew. During the critique, the PI emphasized that the armament of the BIFV is not like that of a tank and that security measures to include terrain driving are a necessity for survival on the battlefield.

A mounted night assault was planned and executed. The speed of operation was hindered by non-availability of night vision goggles (AN/PVS 5) for the commanders. The exercise emphasized movement control measures considerably more than fire control measures.

The defensive operation of the TEWT was conducted much like in past classes. A platoon of tanks were used to form a company team. Primary tasks scheduled for this operation were designation of fighting positions; preparation of range cards and sector sketches; development of fire plans; positioning of antiarmor positions; positioning of BIFVs, tanks, and the company commander's vehicle; and routes and methods of disengagement.

Training during Class 1-85. Significant training related organizational changes occurred during this class. At the onset of tactics instruction, the Branch Chief of Tactics Division, CATD, USAIS presented a 15 minute introduction on topics and the sequence of training over the next three days. Among other things, he mentioned that students of widely varied ranks, source of commission, and mechanized experience presented instruction difficulties for organization of a suitable training environment.

A one and one-half hour lecture on defense was followed by a different practical exercise than used in previous classes. The terrain model exercise was replaced by an exercise that required planning of a simulated defensive operation conducted on Ft. Benning terrain using a 1:50,000 scaled map. All students below the rank of captain were organized into groups of four to five that had members with varied ranks. These groups were given a company level OPORD and had to develop Paragraph 3 of a platoon-level OPORD. All captains were placed into a single group and were given a battalion-level task force OPORD and had to develop a company level order to be delivered to the three platoons. Planning time of one hour was allowed and plans were presented to the entire class for about an additional hour.

Another class format change in Class 1-85 was a 30 minute presentation delivered by the Chief of Tactics Division, CATD. Content of the presentation focused on BIFV-specific aspects of mechanized operations and differences between the M113 and BIFV.

The classroom lecture on offense was cut to 15 minutes to allow sufficient time for conduct of the offensive operation practical exercise. About one and one-half hours was spent on a map-oriented offensive operation practical exercise conducted in a manner similar to that used for defense. The first day of training contained a discussion of the most recent, unpublished positions of the Infantry School and TRADOC on critical tactically relevant issues.

There were no major changes in conduct of the TEWT when compared to Class 3-84. Primary activities consisted of a road march, moving in formation using hand and arm signals, preparation of an OPORD for a mounted assault and execution of the mission, and movement to an assembly area under limited visibility conditions. Training was concluded on the first day by about 1900 hours. The defensive operation conducted on the morning of day two of the TEWT was similar to that of past classes.

After students had finished cleaning vehicles and completed administrative details in the motor pool, they received concluding remarks from, and had tactically related questions answered by, the Chief, Tactics Division, Combined Arms and Tactics Department. Primary topics of discussion were fire control (e.g., weapons ready posture) as related to offensive operations, span of control with BIFVs and dismount elements on separate battle positions, and the importance of keeping squad members informed.

## CONCLUSIONS

It can be concluded without reservation that instructors and administrators involved in the BIFV Commanders Course are highly competent and motivated in providing the most efficient instruction possible. It is evident that course personnel are doing more than a job; they do whatever is necessary to provide the best possible training. There has been an enormous improvement in training efficiency over the two years of observation. Furthermore, the cooperation provided by Tactics Division and 29th Infantry Regiment (formerly WGMD) during the conduct of this analysis indicates the desire to further improve the course.

Training effectiveness and efficiency were extremely high during the first two weeks of the course when instruction focused on Skill Level 1 and weapons maintenance tasks. Efforts to optimize training effectiveness and efficiency in this portion of the course are in progress as instructors and course administrators are implementing minor changes in training sequence, amount of time devoted to each training objective, and student performance evaluation.

The third week of training was primarily preliminary gunnery. Potential areas of training improvement are elaborated in a ARI-Litton Mellonics gunnery report that will be completed January, 1986. It will recommend training techniques and methods to improve BIFV gunnery. This should ultimately impact on organization and sequence of training, time devoted to training, and training resource requirements.

Training effectiveness and utilization of time for prefire and live fire gunnery was a primary concern of WGMD resulting in this analysis. Observations confirmed problems in training effectiveness and efficiency of the live fire portion of the course. While modifications in training sequence and techniques would improve training effectiveness, a major source of problems is related to the need for extensive hands-on training, the number of BIFVs required to perform hands-on training, considerable range resources, and regulation of the number of students allowed to attend the course.

Operation and firing of the BIFV is taught during the first five weeks of the course while the final three days are dedicated to training the leader to effectively use the BIFV in combat. The BIFV is still relatively new to the infantry and tactics have always been one of the most difficult areas to train. Restructuring of the training environment has continually occurred as instructors and administrators attempt to deal with problems created by limited time and resources. The limited time available for tactical training, the occurrence of training after the student has completed graduation requirements, the lack of student evaluation, difficulties in determining techniques and methodologies that most effectively train tactics, and the occurrence of excessively large class sizes have created problems in tactical training.

The remainder of this section is divided into three sections: Factors Affecting Gunnery Training And Evaluation, Factors Affecting Tactics Training And Evaluation, and Course Content. The first two subsections cover factors that include student-to-instructor ratios, course length, and other

organizational and administrative considerations. The content section covers content areas either in need of improvement or which need to be added to the POI.

#### Factors Affecting Gunnery Training And Evaluation

Optimal course length and number of students is determined by factors that include optimal student-to-instructor ratios, number of training objectives, time required to train these objectives, and training resources. Determination of optimal student-to-instructor ratio for BIFV training is severely complicated by hardware and range requirements. While the original question related to optimal number of students per instructor, results indicated that constraints imposed by required equipment are an even more important consideration. Training for Skill Level 1 tasks, gunnery, and portions of tactical training, require hands-on experience and much of this occurs in or around the turret which has limited space for training. There are two seats inside and two locations outside the turret (the gunner's and commander's hatches) that are suitable for occupancy by participating students, observing students, and instructors. Many of the turret-related tasks can not be performed, or even observed in most cases, from locations other than these four specified positions. And even with three students and one instructor in these positions, all students are not necessarily participating in the primary training objective.

Observations indicate that the number of vehicles used for training were frequently less than required by the POI. Equipment-related problems were the typical cause of this unanticipated reduction in training resources. Equipment problems not identified in the motor pool often would be detected after movement to the training area and after vehicle use by students. Placement of the equipment and instructors under the same chain of command has seemed to lessen the negative impact of maintenance-related problems. Statements on maintenance problems are not intended to reflect negatively on the quality of maintenance by 29th Infantry Regiment since many of the problems are a result of the inherent nature of the equipment and not the people who maintain it. However, it is important to recognize that there are upper level limits on the number of vehicles that can be managed for effective training on the range, while there are a minimum number of vehicles required to insure effective training as well.

The number of BIFVs that can be managed in the field also limits optimal class size. Based on observation of training over the last two years, the maximum number of BIFVs available at one time for training has not exceeded 10. One TDA platoon is usually dedicated to a particular class and each platoon has 14 vehicles.

Live fire training constraints have a major impact on training efficiency. Range limitations and restrictions during live fire gunnery create an incredible bottle-neck in training management. Numbers of students and vehicles that could be employed effectively prior to live fire can no longer be used. While as many as 10 BIFVs can be effectively utilized in training prior to live fire engagements, training for target engagement from moving BIFVs typically involves four vehicles which fire one at a time on a rotational basis.

Stationary BIFV engagements usually involve four to six vehicles on the firing line with usually one or two firing at a time. Because these limitations restrict the actual number of students that can fire at one time, the student-to-instructor ratio does not accurately reflect student participation in the primary training objectives.

It was estimated by observers that any one student receives only about 3 hours of training in actual live fire during the 130 training hours listed in this 10 day block of training for live fire. The range is scheduled longer than actually required for conduct of training to allow for unscheduled events like check fires unrelated to BIFV operations, VIP demonstrations, and weather. Students spend time in other BIFV training (e.g., PMCS, ammunition uploading) in preparation for live fire; however, this by no means fills the entire training period.

The potential for limitations on student participation during live fire gunnery creates the need for extensive concurrent training if students are to be meaningfully occupied. Effectiveness and efficiency of concurrent training has increased enormously in the last two years. Little concurrent training existed during the initial periods of observation (i.e., Winter, 1983), and when it was used students often were performing tasks in which they had already received considerable experience (e.g., tracking using the snake board). Students were noticeably bored, frustrated, and angered at the lack of meaningful activities. However, very substantive improvements have occurred in the use of concurrent training as illustrated by the description of Class 1-85. Alternation of groups of students on and off the range on successive days had noticeable benefits. First, by training off the firing range, facilities and resources were often more suited for the type of training being conducted. Secondly, student motivation and interest seemed to remain at a higher level. When students remain on the range while not firing, boredom and frustration quickly ensue. Students alternating on and off the range enjoy firing more because they spend a greater percentage of their actual range time on the firing line.

Optimal class size will be limited by the capability to maintain effective and efficient concurrent training during live fire training since live fire occurs on 35% of the training days. The student load for Class 1-85 was 32. Both gunnery and concurrent training were conducted effectively and efficiently with this class. The two groups of 16 students alternated range time. Four to five vehicles were typically in use and most students were in a BIFV for the majority of range time. In non-firing exercises, as many as 10 BIFVs were effectively utilized.

Concurrent training during Class 1-85 allowed training in content areas which are important for commander training but that were not a formalized part of the POI at this time. Critical tasks either trained or scheduled for training in future classes include 25mm ammunition ballistics, gunnery training devices, extended target engagement information, familiarization on the role and training of the master gunner, more extensive information on the content of technical manual for the turret, and use of the Standardized Test Equipment for troubleshooting turret operations. Present plans for using any additional concurrent training time center around the U-COFT.



The negative impact of a large class on training effectiveness and efficiency was clearly illustrated in Class 3-84 when 49 students created an average student-to-instructor ratio of about 5 to 1. Student participation and observation of training was dramatically reduced throughout the course. Moreover, student dissatisfaction reached its peak during live fire gunnery. Students outwardly expressed their dissatisfaction with the minimal levels of training participation. These negative feelings continued into the tactics instruction and the level of dissatisfaction was explicitly stated in end-of-course evaluations. While student opinions were not a formal part of this analysis, it was clear that both students and instructors had strong negative opinions concerning USAIS and Department of the Army personnel policies for their role in creating this nonproductive training environment.

Student testing and evaluation were topics in this analysis. Two concerns were the need for live-fire qualification and end-of-course evaluation. Review of the POI indicated that performance requirements were not noticeably different from qualification. However, instructors emphasized that gunnery training is presently familiarization and not qualification. Insufficient time and resources are the typical reasons given for not conducting BIFV gunnery qualification in the BIFV Commanders Course. Training objectives did not cover fundamental skills and techniques to include application of appropriate lead and reverse lead, using shot control to achieve firing of sensing rounds and three to five round shot groups, target tracking before and during engagement, and burst on target adjustments. Potential areas of training improvement are recommended in a separate gunnery report (see Bibliography). After the fundamentals of gunnery have been trained, then it is feasible to consider gunnery qualification in the BIFV Commanders Course. If USAIS can not achieve qualification training during conduct of the course, then guidelines need further development to insure that units can train BIFV Commander Course graduates to qualify.

The BIFV Commanders Course is the only USAIS course that trains the BIFV leader to use and maintain his BIFV weapons and to plan and execute the fundamentals required to command his unit. Yet, the BIFV Commanders Course neither qualifies the student as a BIFV gunner nor evaluates his tactical capabilities. Students are aware of this, particularly as it pertains to tactical instruction. Since students are not required to demonstrate their tactical knowledge, it is not surprising that a number of students develop negative attitudes about tactical instruction. They question the utility of the training, particularly since it occurs toward the end of the class at a time when they would rather graduate and leave.

The title "BIFV Commanders Course" misrepresents the training emphasis. The term commander implies that a significant portion of instruction is related to commanding the BIFV. However, five weeks are dedicated to Skill Level 1 and gunnery training while only three days are devoted to tactics. This training occurs late in the course and student performance of training objectives are not evaluated. From the student's point of view, the tactical instruction is viewed as an afterthought. Graduation requirements have been met by the onset of tactical instruction so there is a low level of motivation to perform the required tasks.

Techniques used to train tactics vary with the intent of instruction. Background information, concepts and fundamentals can be presented effectively in classroom instruction. Much of the difficulty in tactical training begins with the techniques and methods required to apply the fundamentals. Practical exercises that require planning while minimizing the complexity of problems associated with execution are a necessary prerequisite to full scale tactical training exercises.

In tactical instruction, there is a transition from classroom instruction to practical exercises or simulations that require planning for tactical operations. The structure of the simulation has undergone a number of changes. The exercise always begins with operations orders being delivered to students who must then develop Paragraph 3 of the OPORD. Students used a terrain model for this practical exercise prior to Class 3-84. The terrain was represented by a three dimensional molded model of the terrain and scaled models were used to represent friendly and enemy vehicles. Use of this terrain model exercise was modified because it was difficult to conduct it with class sizes over about 20 students.

For Class 3-84, the molded terrain model was replaced by a cloth terrain "model" that students could stand around and walk on if necessary. Terrain relief was created by "stuffing" the hills and ridgelines with cloth and other materials. A large class size (i.e. 49 students) contributed to a non-favorable training environment for this form of simulation since there were too many students with too few roles to be played on a single representation of the terrain.

The terrain model simulation was replaced by a map exercise in Class 3-85. Mission planning was based on the OPORD delivered to the students and planning required use of standard 1:50,000 scale military maps. This type of simulation is scheduled for continued use in Class 1-86.

A TEWT has been a part of the BIFV Commanders Course since the beginning. It will be eliminated in Class 1-86 in favor of a game board exercise called Dunkirk. The TEWT has been plagued with many problems to include (a) scheduling after graduation requirements have been fulfilled; (b) no evaluation of student performance and knowledge; (c) insufficient course length to permit coverage of all training objectives; (d) too many students to allow each to assume a leadership role; (e) student reluctance to playing leader or nonleadership roles below their duty position upon graduation; (f) lack of opposing forces; (g) students feeling they already know the training objectives; (h) very negative end of course student evaluations; and (i) the exorbitant cost of field exercises.

Despite all the problems associated with the TEWT, it had one major advantage over terrain model, map-oriented, and game type exercises. The TEWT required the leader to plan, based on realistic terrain considerations. The other previously mentioned exercises create unrealistic depiction of terrain. Maps and terrain boards do not provide the detail for leaders to determine fields of fire and fields of intervisibility. As a result many of the plans developed in the indoor simulation environment would not apply in the real world. Utilization of the terrain has always been a key to success for the infantry. However, it undertakes a new dimension with the BIFV. In the past,

infantry weapons dealt with fields of fire that could be measured in hundreds of meters. Now the BIFV demands fields of fire of two to over three thousand meters to maximize weapon effectiveness.

The POI for tactical instruction states that training is on those capabilities peculiar to BIFV operations. However, a major portion of classroom instruction is devoted to mechanized infantry operations in general. In certain iterations of the course, students have expressed dissatisfaction with instruction that was redundant with training received in other courses. Arguments for presenting the fundamentals focus on the need for refresher training. Yet, instructors face a dilemma because a significant number of students had no prior mechanized infantry experience.

With regard to the application of fundamental of tactics to the BIFV, students are generally told that the fundamentals of tactics have not changed, just the techniques. This may be valid, but it also seems to oversimplify the additional responsibilities associated with the BIFV. The fundamentals may have not changed to any measureable extent. However the infantry leader is now responsible for fundamentals for which he has had no training experience. Integration of BIFV firepower will be a unique challenge to leaders and commanders. Along with enhanced lethality available to the leader, is the security problem created by having this potential. Fundamentals have not changed, but the wide span of lethality of the BIFV requires the infantry leader to know and use techniques in which he has little or no past experience. He must acquire mastery of armor and armored cavalry fundamentals which are now appropriate to his more mobile and lethal battlefield role.

Training tactical fundamentals can be achieved with techniques other than lectures. For example, the Principal Instructor in one class conducted an open-ended question and answer session. The types of questions asked by students was described earlier in the report. It is obvious from student questions that many critical tactical-related issues were still not covered by the current POI. Another effective instructional technique was a presentation by the Chief, Tactics Division, CATD, USAIS of current and critical BIFV-related issues. Tactical employment of the BIFV is an evolutionary process and only a higher level officer involved in tactical literature development is knowledgeable of the many critical issues.

#### Course Content

Course content was not a major study area requested by WGMD for this analysis. However, determination of optimal course length is dependent upon the task requirements. It was not possible to perform a formal task analysis given the time and resources dedicated to this analysis. But, given the knowledge and expertise gained in the areas of gunnery and tactics over the past two years, it was possible to determine content areas and tasks receiving insufficient training or no training at all. These are presented below along with the rationale for considering the task to be critical.

1. Practical exercises in use of the thermal mode of the ISU.

2. Practical exercises in target acquisition, identification, and classification.
3. Use and preparation of range cards and sector sketches.
4. Range estimation.
5. Execution of fundamental gunnery skills and techniques.
6. Execution of fire commands at squad and platoon level.
7. Knowledge of 25mm ammunition ballistics characteristics.
8. Combat loading and familiarity with Basic Issue Items and the Additional Authorization List.
9. Techniques required for mounted land navigation.
10. Relationship between communication hook-up alternatives and their impact on command and control.
11. Integration of surveillance, target acquisition and night observation (STANO) devices and the BIFV into a limited visibility surveillance plan.
12. Combined arms operation.

The importance of items 1 through 7 will be discussed in the ARI gunnery report but will be summarized below. With regard to Item 1, there are no practical exercises in the interpretation of thermal images. Training is required since thermal images are not replicas of what is seen with unaided optics. Use of the thermal mode will be the norm in combat because of a visually obscured battlefield and since darkness occurs about half of each 24 hour day. Target detection, identification, and classification will be complicated by differences in the appearance of unaided daytime and thermal-type images.

Training for target detection, identification, and classification has been reduced from minimal to nothing since the onset of the course. Target identification training in the earlier classes involved classification of vehicular and aerial targets as either friend or foe. Time was devoted to both training and testing during the initial iterations of the course up to about the middle of 1984. Class 1-85 conducted only a pretest of identification of friend or foe and all students passed, so no training was given.

Training for identification of friend or foe does not occur at target ranges that are anticipated in combat. Target presentation typically consisted of 35 mm slides, line drawings, and 1:35 scaled targets; binoculars are used with the latter. Targets rarely simulate ranges of over 2000 m. With a maximum engagement range of 2700m for APDS 25mm ammunition and either 3000 or 3750m for the TOW, it is obvious that students are not being challenged with the types of conditions that will occur in combat. Target identification training, when it did occur, did not cover all required

aspects. For example, classification of a target as only friend or foe does not enable the BIFV crew to select the correct ammunition for killing either tanks or personnel carriers. Furthermore, the course has also to train and evaluate knowledge of the lethality (e.g., maximum effective range) of critical threat weapons. Students are informed of the classification of targets as most dangerous, dangerous, and least dangerous but the specific information on enemy weapons lethality is not provided as background information.

Students are not adequately trained on the operational capabilities of the range card. This is best illustrated by a student's comment the morning after he had received the range card classroom instruction during Class 1-85. He said that a group of students had discussed the range card and could not come up with a good reason for preparing one. Very basically, the range card is a drawing that represents the location and range to man-made and natural terrain features in a BIFV sector of fire. This range information is critical for both daylight and limited visibility gunnery since the range must be indexed into the fire control system. The range card should not have to be referred to on every engagement. In the process of preparing the range card and by using it during target acquisition, the gunner becomes familiar with the terrain. A drawing or representation of the terrain provides the gunner with a working knowledge of the terrain.

The range card is also critical for scanning and target acquisition during use of the thermal sight. Particularly during darkness, it is difficult for the user to remember and determine reference points for scanning. Objects and features marked on the range card allow reference points for identification of the location of where the user is observing, serve as a guide for the start of scan pattern, and provides data for indexing range for target engagement as reference for the start of scan patterns.

Four major training problems exist for the range card. First, the functions and utility of range cards are not clearly defined in instruction or in tactical training literature. Second, students are not required to produce a drawing or representation that even closely approximates the terrain. Third, without adequately constructed range cards, it is not possible to practice the construction of platoon level sector sketches. Finally, until Class 3-85, students had not been required to use range cards in training. Class 3-85 used range cards for night fire; however, range cards can be equally important for daytime engagements.

Closely related to problems in thermal imagery interpretation and use of range cards for thermal scanning is the lack of an integrated platoon limited visibility surveillance plan. Class 3-85 conducted the defense during the night; however, the only limited visibility equipment available was the thermal mode of the ISU. Platoon surveillance planning was not part of the operation.

Range estimation is taught in the course, but as discussed in the ARI gunnery report, current techniques have many inadequacies particularly in the combat environment. Problems in estimation of range are especially evident during conduct of live fire with 25mm training ammunition at Fort Benning.

Armor-type fire commands are a relatively new language for the infantry. Training for fire commands begins two days before live fire gunnery. Students usually have not mastered the commands prior to the onset of live fire. Recommendations for improving training are presented in a separate report (see Bibliography). Execution of platoon level fire commands is not a part of the course.

Ballistics data for 25mm ammunition will be scheduled as concurrent training in Class 1-86. Ballistics information was not initially taught to commanders because it was believed that a commander did not require an understanding of ballistics. It is now realized that a soldier has to thoroughly understand his weapon system. Understanding of the ballistics table is critical for construction of firing fans during training. An understanding of ballistics is equally important for other live fire applications. Superelevation data provides the gunner and commander with information on drop of the projectile at varied ranges. Flight time to round impact is the cornerstone for calculating and understanding lead requirements for engaging moving targets.

Major combat loading problems have been noted in field exercises. Technical manuals do not adequately or realistically designate the location of cold weather equipment, NBC equipment, and load bearing equipment. And because of the location and disorganization of equipment like this, observations indicated that ammunition uploading and firing port engagements would have been virtually impossible. Some units have SOPs for equipment stowage; however, accessibility to equipment stowed in vehicles is a significant administration problem for the commander. Commanders must understand how to combat load before they can supervise it.

Mounted land navigation techniques are not taught in the course. Problems in this area were obvious during road marches and offensive operations during the TEWT. In addition, ARI has observed land navigation deficiencies during ARTEPs in both Germany and Fort Hood, Texas. Problems occurred even over terrain familiar to many of the troops.

A primary mission of the BIFV is to fight along with the M1 Abrams tank. Classroom tactical instruction discusses aspects of combined arms operations; however, the presentation is made by an infantryman. The role, capabilities, and fighting techniques of fighting with the tank needs more extensive treatment. One TEWT incorporates a section of tanks into a defensive exercise and planning by infantry leadership left much to be desired in terms of optimal utilization of the firepower of the tank and security for the tanks.

#### RECOMMENDATIONS

Recommendations will be restricted to the BIFV Commanders Course even though some may be partly or totally applicable to the BIFV Gunners and Master Gunners Courses. Recommendations do not include those previously made in other ARI reports, particularly those that will be listed in the BIFV gunnery report. Content areas covered in that report include target acquisition and identification, range estimation, preparation of range cards, and fire commands.

Recommendation 1. Set maximum class size at 30 and closely regulate it.

Student-to-instructor ratio and class size are interdependent with given time and resources. Student-to-instructor ratio is affected as much by hardware/equipment considerations and range requirements as the number of students that one instructor can effectively train. It is estimated that a maximum of 10 BIFVs can be managed in a training environment. This number is reduced to four to six during live fire exercises and all of these BIFVs can not fire at once. A large proportion of hands-on BIFV training has an upper limit of three students per instructor plus BIFV combination. The recommendation of a maximum class size of 30 assumes 10 operational BIFVs with a typical arrangement of three students per vehicle. It should be emphasized that a three to one ratio of students to instructors is a maximum and not an optimal number. Even with this ratio it is common for actual student participation in the training period to be 33 percent. Larger student-to-instructor ratios for hands-on training not only decreases the percentage of participation but makes it impossible for additional students to even observe training because of space limitations within and around the BIFV.

One of the most critical problems with the course is that the number of students admitted to the class is not strictly regulated. The recommended class size is 30 students; however, considerable variation occurs in the number actually attending the course. Thirty-two students attended Class 1-85 while 49 students participated in Class 3-84. The size of the latter was 53 percent over the recommended student load.

An excessive number of students are often admitted to the course because of the length of time until the subsequent class. However, it should be noted that students with prior New Equipment Training Team (NETT) training have attended the course, and a common reason cited by these students for attending the course is to get gunnery training. These students should receive lower priority for admittance to the class than those who have not received any BIFV training.

Recommendation 2. Maintain the current course length.

Time should not be subtracted from the course until time and resource requirements have been determined for all necessary training objectives. Live fire gunnery results in considerable periods of student inactivity if concurrent training is not integrated into the training period. However, a smaller class size results in considerably less requirement for concurrent training during live fire. The WGMD mentioned the possibility of strictly enforcing the class size at the recommended number which would result in considerably higher training time efficiency for live fire gunnery. Students could then finish live fire in a shorter period than specified in the POI and more classes could be conducted per year. However, the current POI does not provide all the training necessary for a BIFV commander or leader. Use of concurrent training during live fire gunnery provides a means to add required content areas without adding to course length.

Recommendation 3. Rewrite the live fire annex of the POI to allow an accurate description of both live fire and concurrent training objectives.

The POI needs to provide a more accurate description of training during the two weeks of live fire gunnery. The number of hours listed on the training schedule and in the POI for live fire gunnery do not reflect the amount of time that students actually fire the BIFV. The long training days listed on the training schedule insure that a "normal" day of training could be obtained even if training was interrupted by non scheduled events (e.g. poor weather, check fires). Since Class 1-85, live fire gunnery has been split between the firing ranges and concurrent training areas. This type of training needs to be specified within the POI as it relates to the training objectives. Recommendation 4 specifies tasks and topics that need to be included as concurrent training during the the "live-fire" annex of the POI.

Recommendation 4. The following tasks should be added to the POI and taught concurrently during live fire gunnery.

1. Ballistic characteristics of 25mm ammunition.
2. Mounted land navigation techniques.
3. Simulated gunnery training using the U-COFT.
4. Familiarization on the training and role of the Master Gunner.
5. Combat loading.
6. Competitive uploading exercise for 25mm ammunition.

The recommended course size and structure allows concurrent training during approximately one half of live fire training during weeks four and five of the course. It is recommended that the preceding topics and tasks be formally added to the POI and included as concurrent training during live fire training. The rationale for ballistics and mounted land navigation was stated in the Conclusions section. Familiarization with the role and training of the Master Gunner is critical since this position is new to the infantry. The success of gunnery training in the unit will greatly depend on the Master Gunner; therefore, leaders and commanders must understand his assets and capabilities if they are to be effectively utilized. The U-COFT training should focus on those aspects of training that can not be easily covered in the live fire annex of gunnery (e.g., TOW engagements, 25mm engagements with HEI-T ammunition, back-up sight engagements, and limited visibility engagements). Combat loading and competitive ammunition uploading could be conducted sequentially. A complete ammunition upload (70 rounds of APDS-T and 230 rounds of HEI-T) would be performed in a combat loaded vehicle with ammunition stowed in locations specified by the load plan. Small groups of students would compete for the shortest upload time. This extended uploading training would compensate for the less rigorous conditions that exist during current 25mm ammunition upload and download training and testing. The competition would also set the atmosphere for individuals and small groups to develop time-effective techniques for ammunition uploading under conditions expected in combat.



Recommendation 5. Develop and implement a BIFV tactical test and make passing of the test mandatory for graduation.

Based on the graduation requirements for the course, the BIFV Commanders Course could be relabeled the BIFV Gunners Course. Students in the BIFV Commanders course fire more ammunition than do students in the BIFV Gunners Course. The BIFV Gunners Course does not provide the tactical instruction provided in the BIFV Commanders Course; however, students in the latter are not held accountable for the tactical information presented to them. Reading assignments for tactics are not given until three days before the end of the course by which time the students have completed all graduation requirements. A tactics test could be administered during the first week of live fire gunnery and a retest could be administered on the second week. Advance reading assignments covering testable material should be given on day one of the course.

It is often stated that mechanized infantry tactics are similar for both the M113 and BIFV; however, the BIFV creates unique challenges in the use of firepower. The test should focus heavily on BIFV-unique considerations in planning for and control of firepower. Included in this would be considerations for (a) the lethality of BIFV weapons in relation to target type and ranges and (b) the threat posed by different enemy weapon systems at different ranges. While the latter may be classified as gunnery information in certain situations, it is important to recognize that tactics and gunnery are not so distinctly classified in a combat environment. Gunnery and tactics are too "cleanly" separated in the BIFV Commanders Course. The tactical test should not separate gunnery-related techniques and information that impacts on tactical operations. The course currently does not require the student to demonstrate his capability to plan for and use BIFV firepower at the platoon, or even the squad, level.

Recommendation 6. During tactical training, have the Chief, Tactics Division, CATD, USAIS present and discuss current, critical tactically related BIFV issues.

With the evolution of tactically related BIFV developments, it is critical that newly qualified commanders are knowledgeable of and understand the latest BIFV issues. The person with the most knowledge in these areas is the Chief, Tactics Division, CATD, USAIS. This would emphasize the importance of tactical training in the course. Furthermore, while an NCO or a captain could present a prepared presentation, it is critical to recognize that captains attend the course. With the assumption that every soldier considers himself to be an expert in tactics, then it adds a higher level of authority to the presentation if the presenter outranks the students.

Recommendation 7. During tactical training, have the Armor Liaison Officer to the Infantry School present and discuss the role of armor in company team operations.

Prior to introduction of the BIFV, mechanized infantry in combined arms operations served primarily as a local security element for tanks. With the capability of the BIFV to kill both light skinned vehicles, personnel carriers, and tanks, the combined role of company team operations becomes even

more complex. The infantry leader, more than ever before, must think as both an infantryman and an armor officer. The infantry leader may have to lead or be led by armor. Infantry must understand the capabilities and missions of armor so that their actions can be anticipated and planned with the same level of competence as infantry operations. A credible presentation of the role, capabilities, and techniques of armor should come from quality armor personnel having armor experience and an understanding of infantry fundamentals.

Recommendation 8. At the conclusion of the course, the Commander of the 29th Infantry Regiment delivers a presentation on critical considerations, situations, and problems that exist in BIFV units.

Unless a student had prior experience in a BIFV unit, he will be confronted with a unique environment in his new unit. Maintenance, tactics, training, and personnel considerations have taken on new dimensions. Potential topics of discussion during the class could include the following:

1. Major maintenance and equipment-related problems.
2. Impact of personnel turbulence.
3. Relationship between the Master Gunner and squad and platoon level leaders.
4. The criticality of unit gunnery sustainment since neither NETT nor BIFV courses provided at USAIS qualify gunners.
5. Current and potential changes to BIFV doctrine, tactics, and techniques under consideration by USAIS.
6. The importance of unit tactical SOPs (squad, platoon, and company level) to facilitate unit tactical operations.

Recommendation 9. Develop and implement a night defense practical exercise where range cards and sector sketches are used for target acquisition and fire planning and control.

This recommendation involves tasks taught by both the 29th Infantry and the Tactics Division; and here lies a major source of problems in the course. Tactics and gunnery training are separated even though they will occur together in combat. Range cards and target acquisition are taught as gunnery subjects while the principle tactically related tasks include sector sketches, fire planning and control, and platoon level surveillance under limited visibility conditions. Technically, these gunnery and tactics tasks could be separated in training but their relatedness in combat would be more lucidly illustrated if they were joined in a single exercise. An effective training scenario would require as primary tasks: (a) preparation of range cards, (b) preparation of squad and/or platoon level sector sketches, and (c) preparation of a limited visibility surveillance plan. A critical element would be placement and movement of target vehicles in the defensive sector. Probing by dismounted personnel would also occur.

A noticeable problem in tactical field exercises as conducted by the Tactics Division has been an insufficient number of Assistant Instructors for each vehicle. Training problems are compounded since student motivation during the TEWT has been insufficient to achieve task performance without supervision by instructors. It is recommended that instructors from the 1/29th Infantry provide assistance to the Tactics Division in this exercise.

Determination of terrain suitable for this type of exercise is a major concern. Carmouche Range has several features making it well-suited for the exercise. A combination of long field of view with intervening dead spaces created by valleys and sporadic wooded areas make this range very similar to much of Germany. Dug-in defensive positions do not exist; however, the primary intent of the exercise is not the execution of a defense against an OPFOR, but to prepare for an attack by the enemy under limited visibility conditions.

The TEWT has always been scheduled at the end of the course. It attempted to accomplish too much in a short period at a time when student graduation requirements had been met. Negative opinions from students concerning the TEWT were fresh in their minds for the end of course critique. The exercise, as structured in Recommendation 8, would not have to occur at the end of the course. The student has been taught all necessary BIFV gunnery operations required for this exercise by the completion of prefire gunnery. The recommended exercise could be placed between prefire and live fire gunnery. Student experience gained from use of the range card and additional familiarization with turret operations, experience under limited visibility conditions could enhance his capability and further prepare him for live fire. From a tactical standpoint, live fire gunnery should be performed after the student becomes more familiar with the tactical aspects of gunnery.

#### SUMMARY

The BIFV Commanders Course trains leaders from squad through company levels to operate and tactically employ the BIFV. Training is extensive in its scope covering Skill Level 1 tasks, gunnery, and tactics. Unique and challenging training requirements are created by the wide range of student ranks and prior mechanized experience, the comprehensiveness of training requirements, the relatively short time the infantry have had the BIFV, and the impact of the latter on tactical employment. The course itself has quickly passed the stage of infancy because of the quality of personnel dedicated to it.

Enormous improvements have been observed in training effectiveness and efficiency during the past two years. The overall quality of the course is very high considering its scope and the short period since its inception. Most of the training has achieved a level of quality where minimal improvement can be expected. The greatest areas of improvement can now be achieved in areas that include stricter administrative regulation of class size, addition of content areas not covered and/or included in the POI, and a greater degree of interaction between gunnery and tactics instruction.

The latter is a major weakness in the course which will require a much closer relationship between instructional divisions responsible for gunnery and tactical instruction.

The current analysis resulted in a number of recommendations for course improvement. It should be recognized that the role of ARI in training goes well beyond problem identification. The expertise and knowledge gained over the 2 years of research on the BIFV makes ARI well suited to cooperate with designated proponents in the development and implementation of any or all recommendations.

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